ForesTalk

A QUARTERLY PUBLICATION OF THE BRITISH COLUMBIA FOREST SERVICE, VICTORIA, B.C. SUMMER 1975 - VOL. 3, NUMBER 2

2007-04830/

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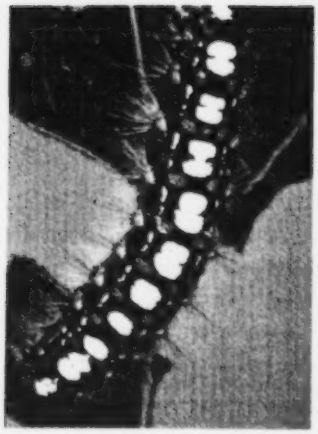

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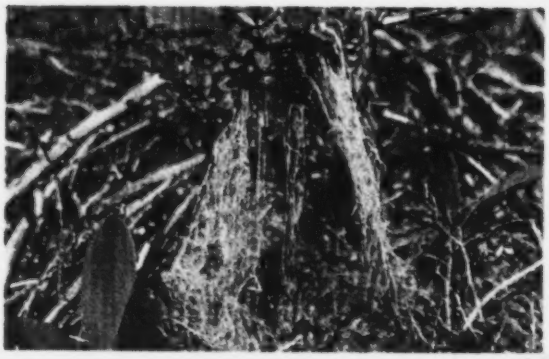

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COVER: Each year huge areas of forest lands are destroyed carelessly. Use caution in or near forest areas and observe campfire regulations.

ForesTalk SUMMER 1975

THE GOVERNMENT OF
THE PROVINCE OF BRITISH COLUMBIA
DEPARTMENT OF LANDS
FORESTS AND WATER RESOURCES
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British Columbia Forest Service,
Legislative Buildings, Victoria, B.C.

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Policy Statement
The objective of the British Columbia Forest Service, as the forest administrative agency for the government of British Columbia, is to develop and enforce policies which will ensure for all time the proper balance of timber supply, forage production, forest recreation, wildlife protection and environmental preservation on the Crown forest lands of the province.

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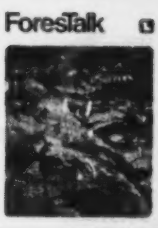
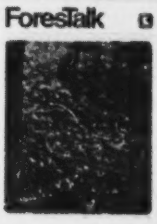
THE LAST FORESTALK

Summer 1975



Summer 1973



Autumn 1973

Winter 1973

Spring 1974

We have found over the years that forestry's integral role in the economy of British Columbia does not necessarily mean that the people of this province are fully aware of the ways in which their forests are being managed. We have also found that the news media aren't always interested in, or have room for, some of the things we have to say. But the most important factor the Forest Service has been aware of is that British Columbians, for the most part, want to know what is going on in their forests.

ForesTalk was created to fill these needs. The magazine is free and the mailing lists have been designed to achieve wide readership with a small circulation and expenditure. Our readership, as a result, is estimated at 180,000, at a cost of a few cents per reader.

But forestry can no longer be isolated in terms of management. Many other factors are now being considered such as mineral resources, recreation, land and water uses, fish and wildlife considerations, agricultural needs, urban pressures, as well as traditional forestry needs.

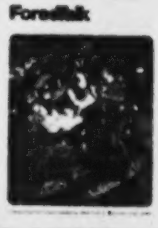
In view of the complexity of resource management in British Columbia, and our responsibility to the people of the province to inform them of activities and decisions involving the uses and management of these resources, ForesTalk will move to expand its viewpoint starting with the autumn edition. Therefore, this is the last ForesTalk as you have known it.

In the Fall, when you normally receive ForesTalk, a new magazine called **Land** will take its place. It will still be free and will be available to anyone who wishes to be placed on the mailing list. Reporting will remain unbiased and opinion making will still be the prerogative of the reader. There will be more pages and a much broader presentation. There will be a letters page where you can ask questions concerning resource management and **Land** will make sure you receive an answer in either published form or directly.

You can look forward to articles and photos from the Provincial Departments of Lands, Forests and Water Resources; Agriculture; Recreation and Conservation; Mines and Petroleum Resources; Environment and Land Use Committee Secretariat; and outside interests as they relate.

Your response to ForesTalk has been tremendous over the past three years. Its editorial and graphic style has been well accepted and credibility has been built. **Land** will carry on in ForesTalk's tradition and it is hoped that the information carried on its pages will be both useful and pertinent to you the reader.

Summer 1974

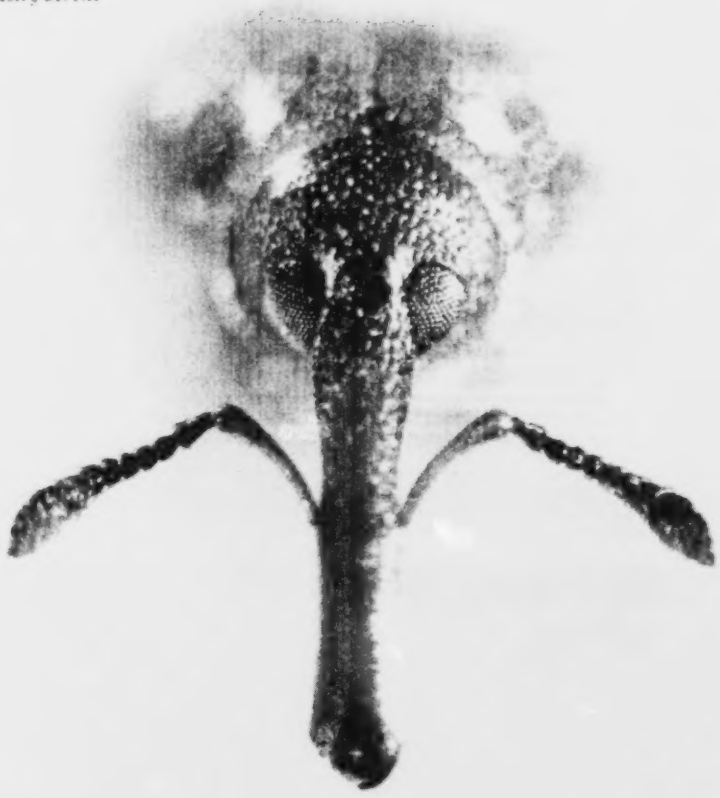


Autumn 1974

Winter 1974

Spring 1975

Sitka Spruce Weevil
Canadian Forestry Service



SILENT DESTRUCTION

by **Ray Wormald**

Contrary to popular opinion, forest fires are not the only major enemy of British Columbia's great forests.

Granted, fire is a formidable foe, and tens of thousands of acres of timbered land have been destroyed by flames and losses have been staggering. Equal, and sometimes greater, losses have been caused by another natural enemy — insects. They have devoured and destroyed vast forest stands.

Right now major insect attacks are underway in many parts of the province. Some 35,000 acres in the Smithers-Houston region are infested with mountain pine beetles . . . and tens of thousands of additional acres are threatened.

And in the Vancouver Forest District alone, it has been estimated that 194,000 acres of timbered land is under attack by the spruce budworm.

The enemy is divided into two distinct groups, explains J.M. (Mike) Finnis, head of the Forest Service's forest pest management section. There are the bark beetles, which present the biggest problem because they burrow into and below the bark of a tree and become almost impossible to reach by sprays or any other means of attack. And there are what he calls the "defoliators" — insects with never-ending appetites which devour the needles of our commercial trees to either seriously reduce their growth or kill them outright.

In the line-up of the most unwanted bark beetles are such varieties as the mountain pine beetle, spruce bark beetle and Douglas fir bark beetles.

Heading the unpopularity poll among the "defoliators" are the spruce budworm, the hemlock looper, Douglas fir tussock moth, and the false hemlock looper — a name which is somewhat misleading because this one attacks Douglas fir. There's also a hungry little devil called the black headed budworm which caused much damage at the north end of Vancouver Island in 1973, and now appears to be heading toward Alaska.

The war against the insects is frustrating. For one thing, their attacks usually start quickly, last three to four years, then end almost as abruptly as they started. And you never know where they're going to show up next.

At present, in addition to the Houston-Smithers area, there are major bark beetle attacks underway in the Kelowna and Canal Flats regions.

In the "defoliator" department, Mr. Finnis reports, it's the spruce budworm that's causing much damage in the Pemberton area now; and the devastation caused by the false hemlock looper and the tussock moth in the Kamloops region is extremely serious.

The Kamloops area problem is so great that a major campaign has been planned for June of this year when some 50,000 acres of insect-attacked forest land will be sprayed in an effort to prevent further spread of the looper. A fleet of light aircraft will be used in the operation; and the spray to be used will be the non-chemical "B.T." which is the easy way of saying Bacillus Thuringiensis.

"B.T.", in essence, is a natural occurring bacterial disease of just one group of insects — moths and butterflies.

The bacterial spray is registered in Canada, and is used extensively for the control of caterpillars in a wide variety of vegetable crops. It presents no danger to cattle, fish, birds or any other form of wildlife. It's expensive — about four times more than chemical sprays. It is available as a powder or liquid concentrate and is applied with water as a carrier. With proper wind (less than five miles an hour) and weather conditions, a light plane can cover about 300 acres per load.

"B.T." sprays were tried experimentally over a 60-acre site in the Kamloops region last year, with "very encouraging results." The tests were conducted jointly by provincial and federal forestry personnel.

The tussock moth will be sprayed with a virus preparation which has been prepared from a naturally occurring virus of the insect itself and is specific to this particular insect. Two different strains will be tested — one developed by the Canadian Forestry Service at Sault Ste. Marie, and one by the U.S. Forest Service at Cornwallis.

Because of the great size of the area being treated for the insect problem, a number of various agencies are concerned. Long before the actual spraying operation commences, representatives of these bodies meet to discuss all aspects of the program. Included are such organizations as the Fish and Wildlife Branch, the Federal fisheries department, Water Resources and Public Health.

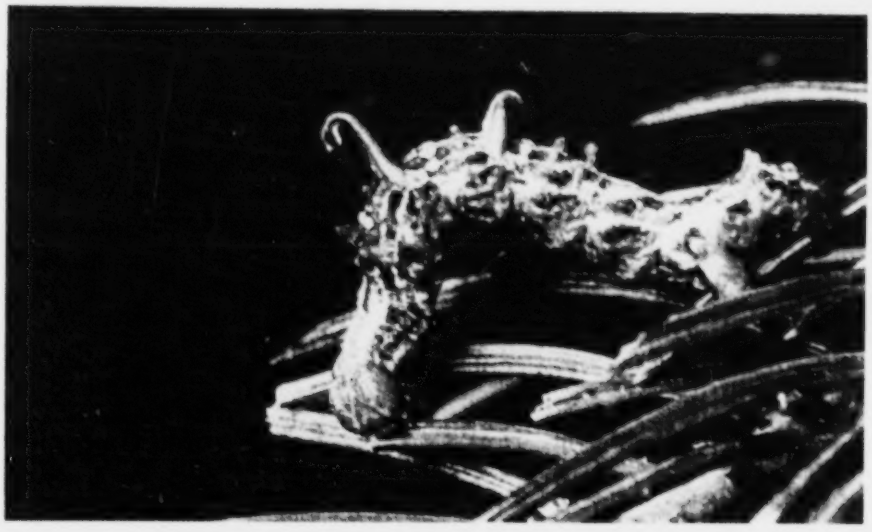
The upcoming spray program in the Kamloops region took on an even greater degree of advance discussion. On April 24, the B.C. Forest Service sponsored an "open house" program in Kamloops to which any and all interested or concerned residents and landowners were invited. They were provided a wealth of detail on every aspect of the operation, and there were provincial resource department and federal forestry officials on hand to answer questions. A special photo display reflected the seriousness of the problem.

What happens after the spray program is finished? This, explains Mr. Finnis, will depend largely on the success (or otherwise) of the operation. It's hoped that a good number of the trees will recover naturally. Some of the dead timber may be salvaged, depending on its condition ... and the general lumber market. Decisions will also come later as to whether or not to replant the treated area.

From a commercial point of view, most of the timber in the area is regarded as low grade. But it's high grade insofar as scenery is concerned. As the forest protection officer notes: no one likes to drive mile after mile through skeleton remains of what used to be attractive forest land.

In the Houston area another "emergency" operation is already under way. About 1,000 acres of forest land has been ravaged by the mountain pine bark beetle and the Forest Service is racing against Mother Nature in an effort to prevent further spread of the infestation.

Filament borer



Men and machines are hastily clearing the dead and dying timber from the region and trucking a lot of it to Barrett (about 12 miles west of Houston) where it will be debarked and then two portable chippers will grind up the beetle-killed timber to produce chips for nearby pulp mills.

The crash program was imperative, forestry officials claim, because at the time the beetle was in its larval stage. It develops wings in the summer . . . and starts to spread again. Preventing that from happening took top priority.

It's estimated there are up to 14,000 cunits of wood involved in the project. (A cunit is 100 cubic feet). Prince Rupert District Forester W. (Bill) Bishop hopes the whole operation will be finished by July, and observes the clean-up is providing jobs for several dozen men, and is utilizing wood which might otherwise be burned.

The enemy list goes beyond those already identified. In addition there are black army cutworms which made their first serious appearance about two years ago in the Prince Rupert and Prince George Forest Districts. Last year they caused about a quarter of a million dollars worth of damage to a reforested area near Golden. There are also the balsam wooly aphids and the European pine shoot moths. Each of them are present in varying degrees in the lower mainland areas. They are a potential hazard and careful checks are being maintained.

Beetle kill on inaccessible site.

As its name implies, it's the Protection Division of the Forest Service which wages war against the insects throughout British Columbia. This year the budget for such purposes is around $300,000 . . . and just about all of that will be used in the 50,000-acre project in the Kamloops region. It's not really a great sum when one considers the annual cost of fighting fires over the past several years has reached and passed the $10 million mark.

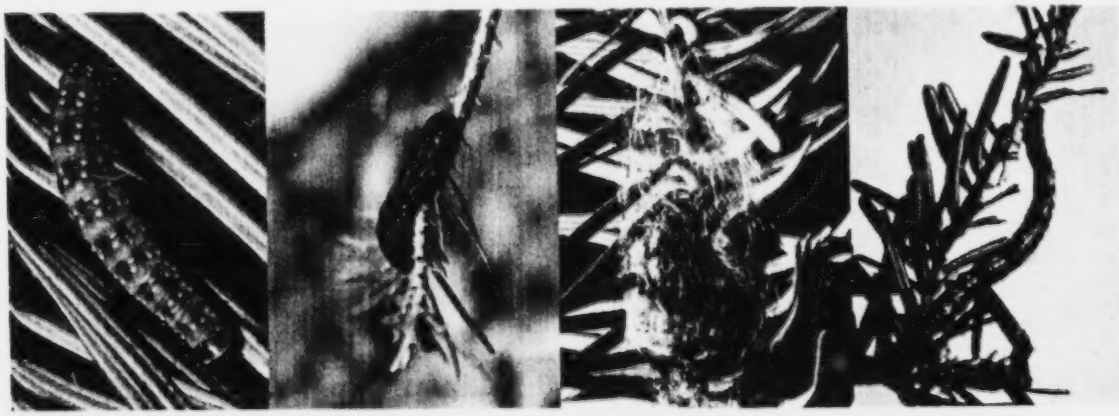
In one major respect, observes Mike Finnis, the strategy against insects should be similar to the fight against forest fires — namely strike the enemy early when it's small.

Regretfully, because of personnel and/or funding problems, this is not normally applicable to the war against the insects.

Raging forest fires, of course, are dramatic and noisy and exciting, in addition to being great destroyers of our timber. And they get a lot of publicity.

Millions upon millions of insects are even more destructive. Relatively few people ever see them; and as they devour our forests they are extremely quiet.

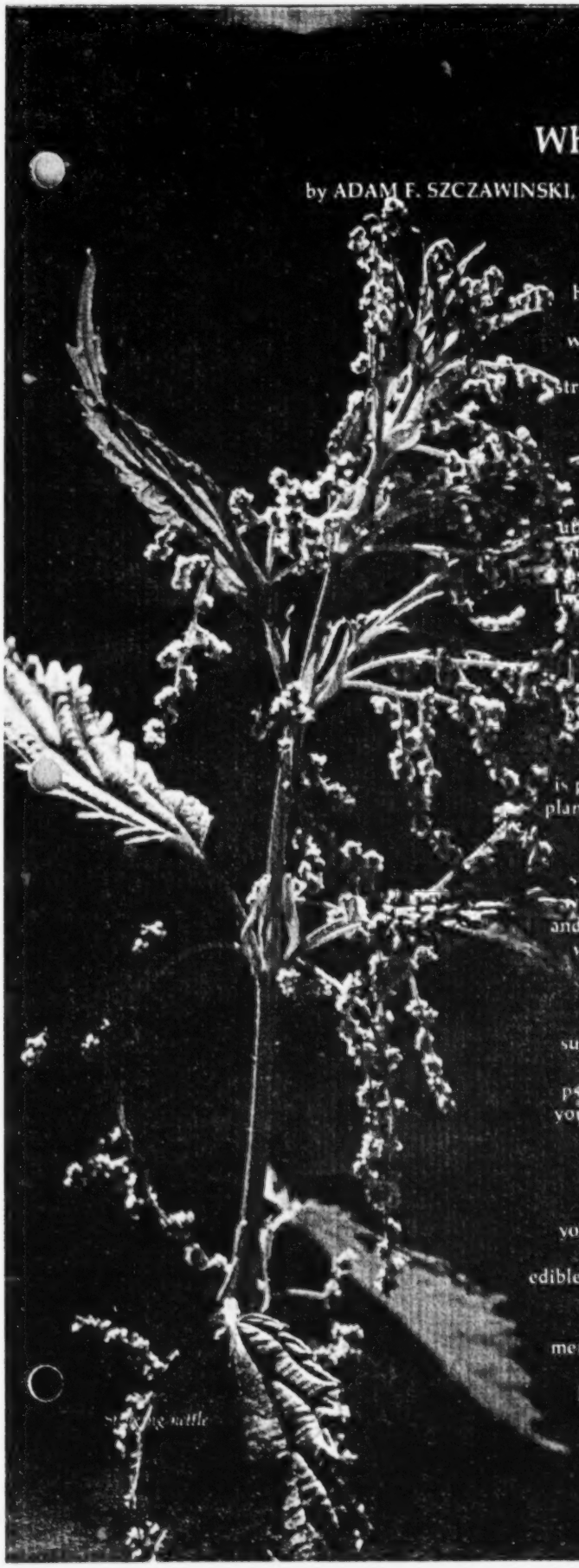
People in the Protection Division figure it's time to start listening a little harder.



Spruce budworm *Black army cutworm* *Tussock moth spinning its cocoon.* *Hemlock looper*

Why Starve In A Land Of Plenty?

by ADAM F. SZCZAWINSKI, Curator of Botany, Provincial Museum, Victoria, B.C.



Early settlers, woodsmen, adventurers and naturalists have provided ample precedent for the utilization of our indigenous wild plants for food. But even today, people who might otherwise profess complete ignorance of wild plants, will readily pick and eat wild raspberries, strawberries and various kinds of blueberries, presumably because they associate these wild plants with their better-known cultivated varieties.

Some Indians still make extensive use of natural plant foods and they still learn the traditional methods of harvesting, cooking and preserving for year-round utilization. But with the coming of the white man and his introduction of a wide variety of new food products such as potatoes, carrots, flour, rice and sugar, the majority of Indians have come to rely less and less on their traditional foods. However, wild berries are still widely used, but are not mashed and dried in cakes as they once were. Today, they are canned, frozen or preserved.

People have always been interested in food provided by wild plants, partly because it is a novelty but certainly because it can be an important source of energy in an emergency when other sources are not available. There is practical value in having some knowledge of edible wild plants; fishermen, hunters, prospectors and downed airmen who unexpectedly find themselves in inaccessible areas and solely dependant upon the food resources of the surrounding wilderness, will quickly realise this. Today, when vast areas of our Province are being explored, more and more people could find themselves in this predicament where a little knowledge of edible plants, or better still a book on the subject, in their kit, would be useful.

We all know that many tasty berries, succulent mushrooms and nutritious pot herbs are available in summer but the situation is quite different in winter. But in either case, one's greatest enemy is fear; cold, psychological fear. Only when this has been overcome can you prepare to meet the emergency. Then your knowledge of wild foods can spell the difference between survival and possible death.

In the following descriptions of emergency plant food, it is assumed you have a knife or some cutting tool at your disposal and, of course, some means of making fire.

In addition to those mentioned, there are many other edible wild plants which can help you through an emergency, including such favourites as dandelion, stinging nettle, sorrel and Lamb's Quarters. You will find them all mentioned in the Provincial Museum Handbook "Common Edible Plants of British Columbia" available from the Provincial Museum for 50¢, and good reading when you are forced to live off the land.

SEAWEEDS

There are no poisonous species known among the seaweeds. However, untreated, most are not palatable because of their indigestibility and high content of organic substances. The Indians of the Pacific Coast use certain species of Red Laver (*Porphyra*) and Sea Lettuce (*Ulva*). Bull, or Ribbon Kelp (*Nereocystis luetkeana*) is used as a food by Eskimos and Alaskan Indians. Dulse (*Rhodymenia palmata*), a widely distributed seaweed found in tidepools or on rocks is eaten raw, chewed like gum, or boiled, by people in many parts of the world.

Labrador tea.

MUSHROOMS

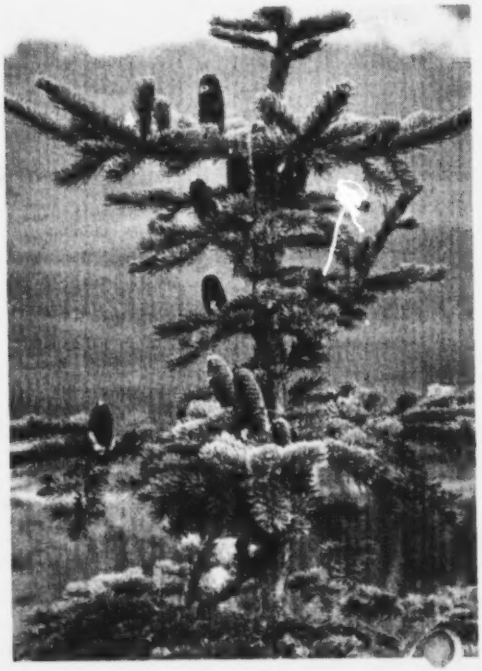
Those interested in mushrooms as a food should use caution. A little investigation of existing literature will reveal a few safe species which are not easily confused with any others. No simple rule or test exists to distinguish edible from poisonous mushrooms. Beliefs to the contrary are more dangerous than complete ignorance and people believing and relying on these "rules" are courting painful sickness and possible death. Never eat a mushroom unless you are sure of its identity.

Cauliflower mushroom

Shaggy mane

PITCHY BALSAM

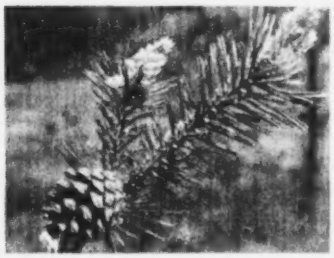
One of the most readily available sources of food in the North, and at higher elevations, throughout the Province, is Pitchy Balsam, a pitch found in the resin blisters of the back of the balsam. It is a disagreeable tasting material which should be eaten only in an extreme emergency but it will relieve the pressures of extreme hunger.



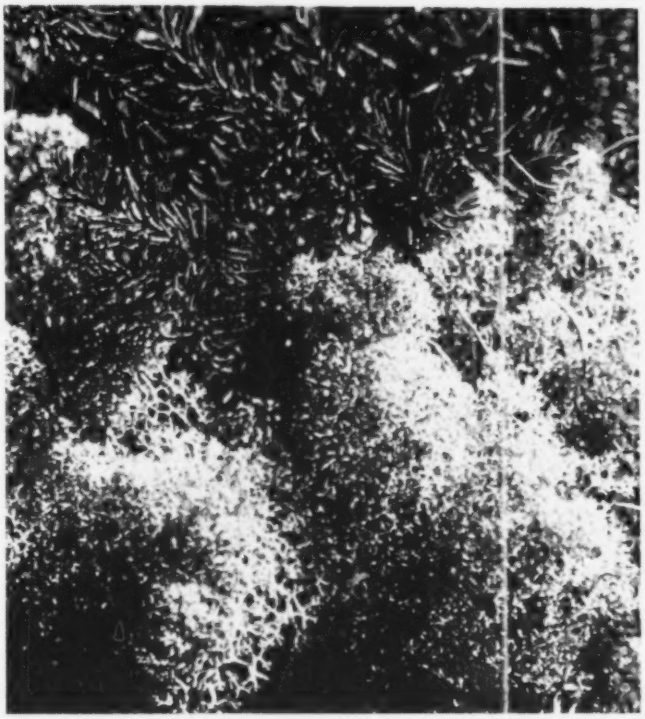
Balsam

BEVERAGES

Labrador Tea (Ledum groenlandicum). The leathery, canoe-shaped leaves of this low branched, strongly aromatic shrub with its umbrella-shaped clusters of white flowers, may be used throughout the year as a substitute for tea. The leaves should be dried first. Labrador tea is common throughout the Province and can be found in muskegs, swamps, bogs, moist woods and wet mountain meadows.
Spruce Tea. Made by steeping young twigs and leaves (needles) of spruce, hemlock, balsam fir and pine. It is an antiscorbutic as well as an agreeable drink.

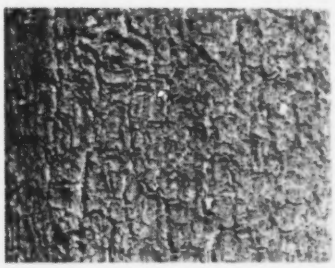


Lodgepole pine



Reindeer moss

Cottonwood bark



White pine

BARK FOODS

The sapwood, or cambium, of several kinds of trees including Lodgepole Pine (*Pinus contorta*) Ponderosa Pine (*P. ponderosa*), White Pine (*P. monticola*), Trembling Aspen (*Populus Tremuloides*) and Cottonwood (*P. trichocarpa*) can be eaten in an emergency. Although tough and difficult to secure these sappy interior barks are a valuable source of nourishment. Their harvesting involves removing the hard outer bark of a tree and scraping the soft inner bark from it.

LICHENS

Lichens are dry, low, variously shaped, grey, brown or black plants often mistakenly called mosses and which favour bare ground or the surfaces of rocks and trees. They are important components of vegetation and in many places, particularly in the north, might be the only available source of food in the winter. Of the many different species of lichens found in our Province, only one is known to be mildly toxic, but only a few are palatable to man. Lichens are rather tasteless and contain an acid substance that may cause severe internal discomfort if not first extracted by parboiling.

Lichen

Streambank Ecology

by J.P. Kimmins, Faculty of Forestry U.B.C.

Gone forever are the halcyon days of logging: the days when timber was the only really important socioeconomic resource that the forest had to offer. The forest is now looked upon as providing a considerable variety of products or values. Although still King, lumber no longer enjoys an unchallenged role in the managed forest. This vital and major segment of our economy must learn to operate efficiently and economically in a manner that reduces undesirable effects on other resource values such as water, fish, wildlife and recreation.

Results of poor road planning near river.

The revolution in forestry philosophy and practice that we are witnessing is not only the result of competition from other resources, however. Some of the past logging may have been very economic when viewed as an individual enterprise, but it was economically disastrous as far as sustained yield forest management is concerned. Logging is only one aspect of forestry. It is a very important aspect since it is where the return on the investment of growing trees is recouped. However, if a method of harvesting the trees precludes or inhibits the regrowth of a future

crop, it cannot be accepted as a viable forest practice. Thus, a major influence in changing forest practice has been the realization that past logging has frequently not been in the best interests of forestry and thus of the province.

One aspect of resource planning conflict is the streambank environment and the role it plays in providing the basic needs of fish. The solution to the conflict between fishermen and foresters lies in keeping fish happy. This can be achieved by meeting the following criteria:

- Cool, clear water.
- Shelter from predators and extreme water flow conditions.
- A supply of food.
- A suitable spawning bed, free of sediment and organic debris.
- Unrestricted movement up and down stream during periods of critical migration.
- A variety of aquatic habitats in which to spend different parts of the year and different stages of the life cycle.

Upon close investigation, one generally finds that the character of a stream is largely controlled by the character of the streambank and the vegetation it supports. For the purposes of this article, I'm defining the streambank to be the land, together with the vegetation that it supports, immediately in contact with the stream and sufficiently close to the stream to have a major influence on the total ecological character and functional processes of the stream. More simply, a streambank is the land, and the plants it supports on each side of a stream, that make the stream what it is.

Role of the Streambank

All aspects of the streambank contribute to the overall well-being of the fish and the stream itself. It provides shade to regulate the temperature of the stream and cover for the fish. It has been shown in several studies that the production of fish in a length of stream is closely related to the amount of cover in the stream. Such cover can be provided by overhanging vegetation, or by the stabilization of streambanks by roots to form cutbanks (natural formation of the banks by the force or flow of the water) and mats of roots hanging in the water. Cutbanks and roots form important feeding stations for fish, in addition to escape cover for fish feeding elsewhere in the stream.

Fish obtain their food from a number of sources. They eat insects falling off streambank vegetation, and aquatic organisms feeding on decomposing leaves in the stream. These form the majority of their diet. Thus, directly or indirectly, streambank vegetation is the source of much or most of the food supply. Plants such as red alder are particularly valuable because they have lots of insects feeding on them and they provide very suitable food for the stream organisms that the fish feed on.

The roots of streambank vegetation play a very important role in stabilizing the streambanks. This provides cutbanks for shelter and shade and reduces the erosion of banks with consequent sedimentation problems. It is not generally realized how important vegetation is in stabilizing soil, but an inspection of roadside

cuts will often demonstrate how a capping of vegetation or an old root will prevent even a relatively unstable soil mantle from being eroded away. Without streambank vegetation, many streambanks would be continually eroding with serious consequences for fish habitat.

Streamside vegetation also acts as a filter to trap both large and small (sediment) materials from getting into the stream. Although intact streamside vegetation will not guarantee that soil and logs will never wash downhill into a stream, it certainly acts as a very significant filter.

Fish predators are generally adapted to a vegetated streambank environment and may require such shelter if they are to successfully utilize the stream's fish resources. This includes such fish predators as bears, eagles and fishermen.

In summary, it is clear that the entire ecology of the stream and the animals that use it is so closely tied to the presence of streamside vegetation, that this vegetation must be considered to be a part of the fish habitat. Thus, in order to keep fish and fishermen happy we must ensure that those parts of the streamside vegetation that are playing a critical role in determining the character of the stream are left intact. Remember, the definition of "streambank" included not merely the physical land at each stream edge, but all the land and the vegetation that it supports sufficiently close to the stream to have a significant influence on its ecological characteristics.

Effects of Logging on the Ecological Character of Streams

Loss of cover and shade have already been dealt with and do not require re-emphasis except to note that in many studies it has been shown that the productivity of a stream is generally reduced when cover and shade are reduced.

Loss of streambank vegetation reduces the supply of food to fish. This loss is compensated partly by an increase in the growth of aquatic vegetation. It is generally felt, however, that there is a net loss of fish food.

Streambank stability is often lost. If logging removes or damages the surface cap of vegetation extensive erosion may occur. For example, if a skidder tears off the surface mat of fine roots, it may create an erosion channel that can become many feet deep. As the roots of cut stumps die and rot, the stability of large sections of a hillside may be lost. Extensive "mass wasting" and slumping of soil into the stream may occur.

Loss of the filtering function of streambank vegetation may or may not greatly affect the stream habitat. Streamside trees prevent a lot of large debris such as logs and boulders from reaching a stream, and can significantly reduce the amount of sidecast from roads that might get into the water. Minor vegetation may help to slow the velocity of water running from a logged area or a road into a stream, allowing much of the sediment load to be deposited. Intact streambank vegetation will not prevent large quantities of heavily sedimented water from reaching fish habitat, however, and leaving an intact green strip along water courses is no excuse for allowing erosion and sedimentation to occur in logged

areas. A green strip will rarely compensate for large scale losses of soil stability in harvested openings.

Logging frequently results in large quantities of slash, chunks and debris getting into the stream. This is particularly bad when logging occurs right to the streambank. Residual trees prevent a lot of this material getting into the stream. The worst problems are found where yarding occurs across water courses. Large quantities of fine and/or large slash is generally deposited in or over the streams. This may, as it decomposes, adversely affect the chemistry of streamwater by lowering dissolved oxygen and raising concentrations of toxic phenols. It may also inhibit movement of fish, especially where sand and stones accumulate upstream from the debris. In this situation the streamwater may flow through rather than over the gravel and slash making fish migration out of the question. Not all slash in streams is necessarily bad, and slash over rather than in streams may replace some of the shade lost by logging to streambank. Nevertheless, more often than not, allowing slash and debris to enter streams during logging is generally thought to be very undesirable. Not the least undesirable aspect of this is the damage done to the stream habitat during attempts at cleaning up the stream.

Streams that have had the majority of their streambank vegetation removed provide a very different visual environment that can adversely affect the behavior patterns of certain fish predators. Most fishermen prefer to hunt their prey in relatively undisturbed stream and streambank environment. For one thing, the probability of finding fish there is likely to be greater. Apparently, bears tend to share the same point of view.

Thus, in summary, it is clear that clearcut logging can have significant undesirable consequences for streams and fish habitat. It must also be said, however: that careful logging in the streambank environment can have minor and acceptable consequences. Much greater damage can be done by post-logging site treatment. As an example, I will discuss slashburning.

Effects of Slashburning on the Ecological Character of Streams

Broadcast slashburning sometimes has far more deleterious effects on streams and fish habitats than clearcut logging. It can significantly aggravate the sediment load of water reaching a stream by increasing the quantity of overland-flow, removing the duff which protects the soil, and by killing or weakening the shrubs and herbs that help stabilize the surface of the soil. Hot slashburns frequently result in long-lasting wide-scale sheet erosion.

It is not uncommon during yarding for considerable quantities of logging debris to accumulate in small stream channels or dry water courses. This results in very hot burns in these locations and often the most severe erosion is immediately adjacent to a water course. In a hot burn, the fire may remove the streambank minor vegetation (at least the above-ground portion) and kill the trees that were left to maintain the character of the streambank environment. In either case, excessive heating of the streamwater can occur, temporarily sterilizing that portion of the stream.

Thus, slashburning can completely undo the careful efforts of the loggers to maintain streambank environment in a desirable condition. It can eliminate shade, cover, streambank stability, fish food supply, the filtering function of the vegetation and radically alter the visual character of the stream environment. The effects are potentially so great that slashburning has to be considered as one of the real problem areas in forestry/fish interactions. Not infrequently, effects of slashburning many miles upstream from important fish habitat can be very damaging because of aggravated sedimentation. Even slashburning stream banks that only carry water during the winter rains can be a source of serious downstream damage to fish habitat.

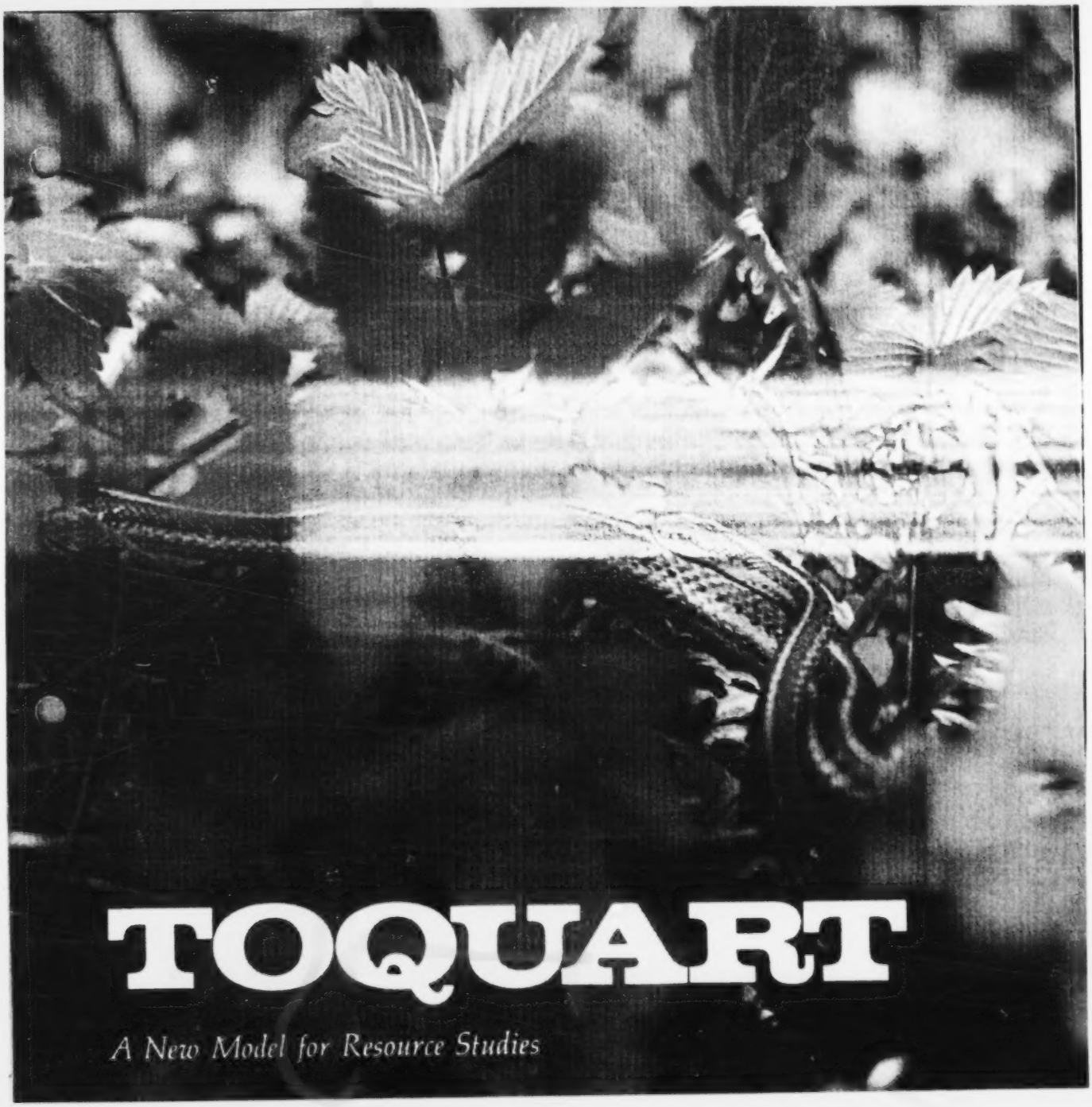
Conclusions

Fish constitute an economic resource just as trees do. They also provide a recreational resource, just as trees do. Where both trees and fish in an area are valued most for their recreational potential, fish/forestry conflicts will be small. However, where the trees are valued most highly for their economic value, there is a potential for conflict between fisheries and forest management.

The solution to this conflict is not unknown: it is not mysterious. It is simply a case of defining the requirements of the fish resource and ways in which the forest can be harvested without denying the fish their basic necessities of life.

Not only are we obliged to solve these conflicts. We also know how to do it in many cases. It is largely a case of good will and understanding on the part of the users of both resources and a respect for the values of the other resource user.

Thoughtless logging practices can result in extensive damage.



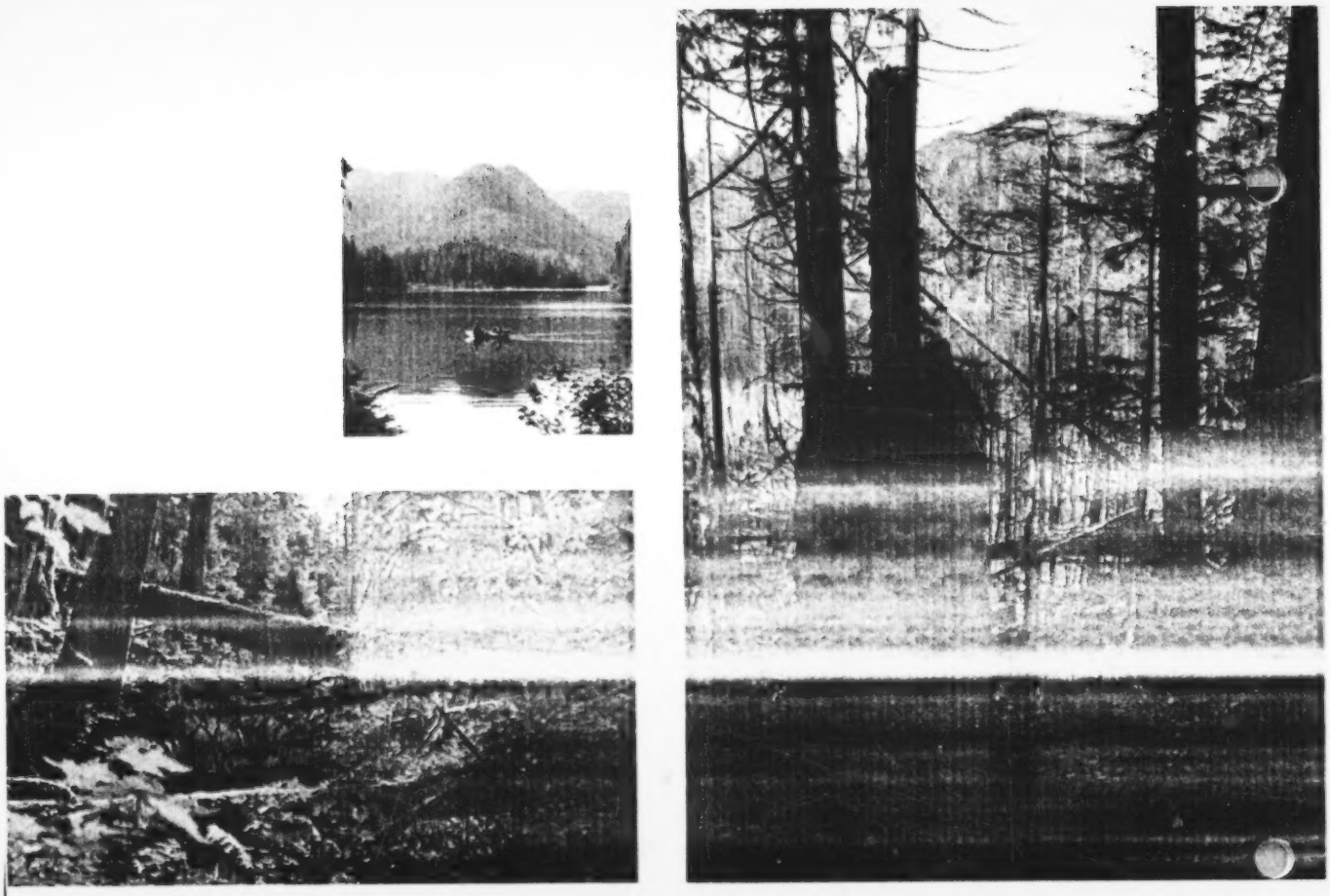
TOQUART

A New Model for Resource Studies

by **A.G. Dagg**

Awareness of the complexity and fragility of the ecological makeup of the forest environment is relatively new, but is growing rapidly.

With this awareness, resource managers now appreciate that planning as a prelude to the extraction or development of our natural resources is frequently made difficult by a lack of detailed and integrated information regarding the characteristics of the area involved.



Close study of a beautiful area reveals decadent timber which can attract destructive insects, diseases and fires.

Several approaches to the problem have been made but now there is evidence that new help is at hand for the resource development authorities. An integrated resource study involving both federal and provincial government agencies as well as the Faculty of Forestry and Department of Soil Science at the University of British Columbia was initiated by the British Columbia Forest Service in 1973.

The essential undertaking was the development of a procedure or model by which necessary environmental information for all resources in a selected area could be collected, co-ordinated and evaluated in a methodical manner. Application of such details to plan for development of any one resource would ensure the desired consideration of all other resources in the area.

As topographical features, climate, soil conditions and other factors vary widely throughout the province, it was decided to design the model for use in the Vancouver Forest District which embraces the south-western part of British Columbia and in which there is at least a degree of consistency in the more essential factors.

Furthermore, although the basic model was to provide for a reasonable degree of flexibility in its application, it was obviously desirable that it be designed for the more complex situations. Accordingly, an area in which there had been little or no previous development and containing an extensive cross section of terrain, soils, vegetation, waterways, wildlife and other resources was selected as a basis for developing the model. This was the Toquart River watershed on the west coast of Vancouver Island.

Development of the model and a study of the Toquart area went hand in hand, each having a bearing on the other. Both are now complete and all agencies involved are well pleased with the results.

The model will be used to study other areas where logging, mining, recreational development or other similar activities are contemplated. And logging will now proceed in the Toquart within the limitations prescribed by the plans based on the findings and recommendations of the study.

There are two major components of the model,

data preparation and data utilization. The preparation phase entails efficient collection and presentation of data to meet integrated planning and management objectives. Utilization involves interpretation of the information and the formulation of recommendations and plans based on it.

Resource inventories constitute most of the material required and the majority of them should be compiled in map form. Careful mapping is required of features such as landform topography, vegetation, fisheries evaluation, slope stability, potential sedimentation yield, wildlife distribution and capability, recreation capability and forest capability.

Other inventories to be mapped at a larger scale include those landforms considered most sensitive to disturbance, sensitive sites along stream and river channels and wildlife winter ranges. Information in such detail provides a basis for more accurate assessment of specific sites requiring particular treatment, especially where roads are to be constructed.

Several methods of evaluating all the information and making recommendations for planning and management purposes were considered but the study group concluded that this should be undertaken by a team of individuals representing each of the resources found within the area of study. This was not only considered to be the most efficient but it should ensure that more of the potential problems or interactions are identified than might be by one person or a smaller group.

In fact this system proved to be so effective during the Toquart study that the establishment of a fully representative group on a permanent basis was proposed. Advantages identified included a close liaison between resource agencies involved, a continual up-dating of techniques and increased efficiency through familiarization with the procedures.

When the study group fully evaluates all data collected and reaches agreement on the constraints necessary in development, its recommendations are passed to the developer along with the basic information. He in turn then makes his plans for the timber harvest, mining, recreational project or other intended resource development. Location and construction of roads, bridges, culverts or dams will be given particular attention.

When completed, these plans and the implementation of them will of course be subject to examination and approval by representatives of the resource agencies concerned.

The findings and recommendations of the study for development of the Toquart watershed were quite extensive and complex but a few examples will serve to illustrate how resource priorities were established and the type of protective measures identified and imposed.

The dominant potential uses recognized in the study area were fish and timber production. However, recreation was also considered to be important, partially due to the high potential for sports fishing and also because of the intensive use of adjacent areas. Wildlife values were considered to be low except in the estuary region which is important for migratory birds.

The first recommendation was related to the intense and frequent rainfall which occurs in the area and it was noted that any disturbance of soils when saturated increased the probability of erosion and sedimentation of streams. For these reasons, the report recommended "that all operation of heavy equipment be limited to periods when soil moisture content in the area of operation is low." This desired condition is normally expected between June and September inclusive.

On the premise that log-skidding equipment can cause excessive soil disturbance and operation of this equipment near main stream channels increases the likelihood of streambank erosion, it was recommended that all logs be "winched away from the banks rather than skidded on a short cable".

Another recommendation stated that a block of mature timber be left at the northeast corner of the junction of the Toquart River and the tributary entering from the east approximately one mile below Toquart Lake, to be developed for recreation purposes due to generally high aesthetic and recreational values in this area. No roads other than a small access road should pass through this block.

Yet another stated that to preserve the aesthetic quality of a specific area earmarked for fishing and to protect the banks of this section of the river, "a leave strip of mature cedar, immature conifers and deciduous species be left on each side of the main river and the major tributary . . .".

Despite the many constraints imposed on the developer who must also comply with the standard rules or guidelines for logging, timber will be harvested in the Toquart watershed. Roads will be prepared this year and actual logging will commence in 1970.

As project co-ordinator for the study group, Ted E. Baker of the Research Division, B.C. Forest Service says: "There are watersheds which should not be logged and the model designed from the Toquart study will help identify them. But of greater concern to all resource agencies has been the rate of the timber harvest in various areas and the methods employed in extraction. Now we have a procedure to help us make the proper decisions."

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